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# Redefining community based on place attachment in a connected world

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## **Abstract**

The concept of 'community' is often employed in environmental policy to foster environmental stewardship and public participation in management, crucial prerequisites of effective management. However, prevailing conceptualizations of community based on residential location or resource use are limited with respect to their utility as surrogates for communities of shared environment-related interests, and because of the localist perspective they entail. Thus, addressing contemporary sustainability challenges, which tend to involve transnational social and environmental interactions, urgently requires additional approaches to conceptualizing community that are compatible with current globalization. We propose a novel framing for redefining community based on place attachment (i.e. the bonds people form with places) in the context of Australia's Great Barrier Reef, a World Heritage Area threatened by drivers requiring management and political action at scales beyond the local. Using data on place attachment from 5,403 respondents residing locally, nationally and internationally, we identified four communities that each shared a type of attachment to the Reef and that spanned conventional location and use communities. We suggest that as human-environment interactions change with increasing mobility (both corporeal and that mediated by communication and information technology), new types of people-place relations that transcend geographic and social boundaries and do not require ongoing direct experience to form are emerging. We propose that adopting a place attachment framing to community provides a means to capture the neglected non-material bonds people form with the environment, and could be leveraged to foster transnational environmental stewardship, critical to advancing global sustainability in our increasingly connected world.

## **Significance statement**

Effective environmental policy requires public participation in management, typically achieved through engaging 'community' defined by residential location or resource use. However, current social and environmental change, in particular, increasing connectedness, demands new approaches to community. We draw on place attachment theory to redefine community in the context of Australia's Great Barrier Reef. Using one of the largest existing datasets on place attachment, our analysis of local, national and international stakeholders identified four communities differing in their attachment to the Reef and spanning location and use communities. Our results suggest that place attachment can bridge geographic and social boundaries, and thus, communities of attachment could be leveraged to foster transnational stewardship, crucial to addressing modern sustainability challenges in our globalized world.

## **Introduction**

The notion of 'community' is often invoked in environmental policy and management to foster environmental stewardship and public participation in management. Public participation (i.e. the processes of consulting, involving and informing the public to allow those affected by a decision to have input into that decision; 1) is widely advocated as critical for achieving social and environmental gains. It is increasingly embedded in environmental policy although it is important to note that the actual power afforded to the public through such processes can vary (2). Current emphasis on public participation arose primarily because of the widespread failure of entirely top-down exclusionary approaches to management and the subsequent recognition of the need to gain public support for management and more importantly, the ethical imperative, at the very least, to 'do no harm' to citizens (3). Community is the unit of social organization most often engaged with to promote public participation and stewardship in part because it tends to be thought of existing amongst individuals who 'share common interests and common identification' (4, p83). This property is particularly attractive to policy makers, not least because it can facilitate collective action in relation to management and stewardship. In the context of environmental policy and management, community tends to be defined by residential location or resource use (5, 6).

However, prevailing approaches to conceptualizing community in environmental policy and management are problematic (5), especially given current global change, in particular, increasing social and environmental connectedness. A well-recognized critique of conventional location and use framings of community is that they are not effective surrogates for communities of shared environment-related interests, and are thus rarely the cohesive entity often assumed in environmental policy (6). Studies show that even when people have a shared use or history in relation to a resource, their interests and preferences in regards to that resource are often heterogeneous (7, 8). This heterogeneity will only increase as contemporary social and cultural change ensures that the boundaries that historically tied people to a single location or occupation are waning (9, 10). Poor understanding of people's values regarding natural resources and misconceiving a collection of individuals as a

homogenous entity with shared environment-related interests has been shown to significantly hinder the success of community-oriented public participation and management (11, 12).

Community-oriented public participation is further limited by the localist perspective taken to community in environmental policy and management (6), which neglects the social and environmental connections with distant places that are characteristic of many modern sustainability problems (13). Emerging literature on place attachment suggests that increasing mobility (both corporeal and that mediated via information and communication technology) allows people to form bonds to places other than those in close proximity (10), suggesting that non-local people can be affected by change (e.g. degradation) of distant places. Further, a localist perspective of community precludes public participation and stewardship of non-local people; the engagement of whom is particularly important given that many drivers of current environmental change originate and require management and political action at scales beyond the local (14). For example, addressing climate change, a key driver of environmental change globally, requires reduction of greenhouse gas emissions, which people across the world can contribute to by participating in climate policy lobbying, reducing their household consumption etcetera. Thus, people living far from a particular place can increasingly affect and be affected by management and policy influencing that place, yet the localist perspective taken to community ensures that community-oriented public participation excludes these non-local stakeholders. Addressing contemporary sustainability challenges urgently requires new approaches to defining community that are not only consonant with our increasingly connected world, but which also remain place based.

Here, we draw on place attachment theory to propose a novel framing for redefining community in environmental policy and management that puts people's shared emotional and functional attachments to a natural resource at its core. We use cluster analysis to examine if place attachment can serve as a common ground for local, national and international stakeholders, and therefore as a basis for communities spanning spatial boundaries; a framing of community in line with Webber's (15) seminal proposition of 'communities without propinquity'. We do not propose that conventional use and location framings of community are redundant; rather, that multiple forms of community are constituted across different people and nature relations and can play complementary roles in environmental policy. Although the literature on community in environmental management has long emphasized the fallacy of assuming use and location communities share environment-related interests, little attention has been given to how the notion of community can evolve to meet the challenges of modern sustainability problems, in particular, the transnational social and environmental connections they entail. Thus, addressing modern sustainability problems requires examination of new framings of community and how they relate to conventional use and location framings.

To this end, we investigate multiple framings of community in relation to the iconic Great Barrier Reef (GBR), a World Heritage Area in Australia, which is critically threatened by drivers requiring civic, management and political action at scales ranging from local to global. Indeed, recent climate change induced coral bleaching in the GBR, unprecedented events (16), highlights the pressing need for engaging non-local stakeholders in public participation and transnational stewardship. Using data on place attachment from 5,403 respondents surveyed adjacent to the GBR but residing locally, nationally and internationally, we: (1) identify whether respondents form homogenous emergent communities based on multiple dimensions of place attachment; and (2) examine how resulting attachment communities relate to the communities of use and communities of location typically employed in environmental policy and management.

**Place attachment** – Place attachment describes the bonds people form with places and the meanings they ascribe to them (17). It is often conceptualized as two-dimensional (e.g. 18), comprising emotional (place identity) and functional (place dependence) attachments. Place identity captures how places offer individuals the opportunity to express and affirm their identity, while place dependence refers to attachment to a place because of its instrumental value in achieving a desired goal. Given that place attachment is an important element of human wellbeing (19), individuals' bonds with a place shape their evaluations of change to that place (20), influencing how they are affected by environmental management and how they engage with it. Indeed, studies have demonstrated the link between place attachment and pro-environmental attitudes and behavior (e.g. 21), and suggest that shared person-place bonds may foster collective action (e.g. 22). Thus, understanding place attachment provides an important means by which policymakers and managers can identify and engage stakeholders in public participation.

The vast majority of literature on place attachment has focused only on local stakeholders (i.e. relations with proximate areas; 23); thus, place relations can be associated with forms of parochialism and are often assumed to be negatively associated with mobility (see 10). The few studies (24, 25) examining cross-scale place attachment have tended to examine individuals' attachment to places of increasing scale; for example, Gustafson (25) compared Swedish individuals' attachment to their residential area, region, Sweden and Europe. Studies

have also compared place attachment to a particular place between permanent residents and non-permanent residents (e.g. 26) or tourists (e.g. 27) and between distant and proximate visitors (e.g. 28). However, our study is the first to explicitly examine attachment to a particular place amongst people living locally, nationally and internationally to that place. A further research gap we fill is quantitatively identifying different *types* of attachment (see 10). Although a number of studies have identified types of attachment qualitatively (e.g. Hummon's (29) five types of sense of place), existing quantitative analyses tend to compare attachment dimensions between groups identified a priori (e.g. 24, 26, 28) or segregate respondents post hoc based on the magnitude of a single composite attachment measure (e.g. 27). These types of analyses do not assess whether individuals can be grouped based on similar levels of different dimensions of attachment and therefore do not allow identification of types of attachment. Quantitatively identifying types of attachment (rather than magnitude of attachment only) requires multivariate classification analyses that segment data into homogenous groups (e.g. cluster analysis); such analyses have had limited application in the place attachment literature (but see 30, which was in relation to local residents only). Therefore, our study extends existing research on cross-scale place attachment (e.g. 24, 25, 26, 27, 28) by being the first to examine whether *types* of attachment (i.e. emergent attachment communities) can be identified among individuals residing locally, nationally and internationally to a particular place.

We classified our respondents using cluster analysis based on place identity and place dependence in regards to the GBR, which we operationalized with 10-point Likert scale statements. We distinguish two sub-dimensions of place dependence, namely direct and indirect dependence. This distinction reflects Rivlin's (31) proposed dichotomy of place meanings based on the nature of people's place experience. She suggests that place meanings can arise either through ongoing direct experience and 'personal life history' in an area, or through indirect experience (e.g. exposure via media) and the 'qualities of the place'. Capturing these two forms of place dependence, thus recognizing that people may instrumentally value a place irrespective of their level of direct experience with it, is increasingly relevant in our highly mobile world and is of particular relevance to our study given the iconic status of the GBR. Further, these two forms of place dependence allowed us to include functional attachment associated with fulfilment of both activity-specific goals (i.e. direct dependence measure) and more general wellbeing goals (i.e. indirect place dependence).

## **Results**

Our cluster analysis based on 5,403 respondents' reported levels of place identity and place dependence (direct and indirect) revealed four distinct clusters (Fig. 1A). Each cluster represents a group of stakeholders that share similar levels of place identity, direct and indirect place dependence, and therefore *type* of attachment to the GBR. The four clusters indicate four emergent communities based on place attachment, which we named based on their type of place attachment as indicated by the level of each of the attachment dimensions (Fig. 1B). Cluster 1 (n=2314) is composed of individuals who have low direct place dependence but the GBR is important for their identity and they value the way of life it supports. In other words, stakeholders in Cluster 1 value the GBR from a distance, thus we named this cluster the Armchair Enthusiast community. The second cluster (n=839) is characterized by high values on all three dimensions of place attachment and we therefore named it the Reef Connected community. Cluster 3 (n=1096), the Reef User community, is characterized by high levels of direct and indirect place dependence but low place identity. Place identity, indirect and direct place dependence are lowest for the fourth cluster (n=1154), which we labelled the Reef Disconnected community.

Members of each key community of use currently engaged by GBR managers (i.e. commercial fishers, residents, tourists, tourism operators, Indigenous residents) are present in all four emergent communities of place attachment (Fig. 2). Yet, the distribution of stakeholders between attachment communities differed significantly between all communities of use ( $\chi^2$  (12, N=5,403) = 567,  $p = 2.2e-16$ ) except commercial fishers and tourism operators (Table S1). Together these results indicate that communities of use are heterogeneous in terms of attachment to the GBR, but some communities of attachment are more prevalent in some communities of use than others. For example, although commercial fishers and tourists are present in each of the attachment communities, the Reef Connected and Reef User communities account for most of the fishers interviewed (36% and 31%, respectively), while the majority of interviewed tourists are in the Armchair Enthusiast and Reef Disconnected communities (40% and 31%, respectively).

Members of each of the 14 communities of location that we examined (i.e. one international, one national, and 12 coastal regions adjacent to the GBR) are present in each emergent community of place attachment (Fig. 3). However, the distribution of stakeholders between clusters differed significantly by community of location ( $\chi^2$  (39, N=5,403) = 625,  $p = 2.2e-16$ ), with pairwise comparisons revealing significant differences between almost all pairs of location communities that include national and/or international communities (Table S2). These

results indicate that perceptions of place do not differ between communities of location within the GBR region, but the prevalence of each community of place attachment differs between communities residing locally and those located further afield. As expected a lower proportion of stakeholders residing outside the GBR region are located in the Reef Connected community than the Reef Disconnected community. Nevertheless, almost 30% of international stakeholders and more than 47% of national stakeholders (residing far from the GBR) are in the Armchair Enthusiast community, which is characterized by the second highest level of place identity and indirect place dependence of all four place attachment communities.

## **Discussion**

Prevailing conceptualizations of community in environmental policy and management, based on residential location or resource use, are limited with respect to their utility as surrogates for communities with shared environment-related interests, and in particular, the localist perspective of community they entail. Given current social and environmental change, in particular, increasing connectedness, new approaches to community are critically needed to address contemporary sustainability challenges. We examined an alternative framing for community based on place attachment in the context of the highly-threatened GBR. We identified four emergent communities that differed in the strength and nature of their attachment to the GBR and that spanned conventional communities of location and use. In this section we discuss the four emergent attachment communities, the processes underpinning the formation of each type of attachment and how this study contributes to advancing theory on place attachment. We then outline how this approach contributes to conceptualizations of community in environmental policy, and provide explicit recommendations for how a place attachment framing to community may be employed to strengthen public participation and stewardship.

Grouping of respondents in communities of place attachment reveals that people's bonds to the GBR manifest in four distinct types. Further, the distribution of communities of use and location between attachment communities suggest that multiple processes underpin the formation of those bonds. The Reef Connected community, which has the highest levels of attachment, contains the most commercial fishers and tourism operators and the least tourists of all attachment communities. This finding lends support to traditional perspectives on place attachment, which argue that attachment forms through ongoing direct (i.e. firsthand) experiential and interactive processes which may involve physical and social dimensions (e.g. 32, 33). These processes reflect those that underpin the rationale of use and location framings of community, namely that commonalities in how individuals use a resource leads to shared environment-related interests and values. Such perspectives on the formation of person-place bonds are further supported by the composition of the least attached community, the Reef Disconnected community, which contains the fewest local respondents and the most individuals residing overseas.

However, contrary to traditional perspectives on place attachment, our results also suggest that ongoing direct experience does not always lead to emotional bonds with place nor is it a prerequisite for the formation of such bonds. For example, more than 30% of commercial fishers in our sample were in the Reef User community, which was characterized by low place identity despite high levels of direct and indirect place dependence. Further, our findings point to additional processes underpinning person-place bonds that, rather than being driven by direct ongoing experience, are facilitated by mobility (including corporeal and that mediated by information and communication technology). The attachment community that is characterized by the second highest levels of place identity and indirect place dependence, the Armchair Enthusiasts, contains the most tourists and national residents, and almost 30% of international residents interviewed. This profile suggests that people can form emotional bonds with the GBR and assign instrumental value to it in terms of general wellbeing goals without ongoing firsthand experience and fulfilment of activity-specific functional goals (which was captured by our direct dependence indicator).

Our study therefore makes two important contributions to advancing the literature on place attachment. First, our study breaks new ground by examining attachment to a particular place among people residing locally, nationally and internationally. Our results inform recurrent debates as to whether place attachment implies parochialism (10), showing, instead, that it can provide a means to transcend geographic and social boundaries. Second, our novel inductive approach (based on cluster analysis) – which has had little application in the place literature (but see 30) – revealed new *types* of attachment facilitated by globalization and mobility processes (e.g. Armchair Enthusiasts).

The multiple types of place attachment revealed by our analysis suggests that the nature of place attachment has evolved, whereby people without ongoing direct experience can form bonds with a place. Indeed, it is increasingly recognized that place attachment may form due to cultural and symbolic meanings that are not

based only on experiential meanings, but rather, are associated with wider sociocultural institutions and identities (34). The GBR is often described as possessing unique 'Australianness' (35) and plays an important role in the individual identity of Australians despite their limited direct experience of it (36). The GBR is also of international significance and may resonate with other identities (e.g. tropical person, environmentalist) that are not related to the GBR as a specific place but rather as a type of place. This form of generalized attachment to place type is suggested to be on the rise as society becomes increasingly mobile and connected across spatial scales (9, 34) and the factors influencing identity shift from 'roots' in place to 'routes' of expression (37). In other words, conceptualization of attachment has evolved from the emphasis on a single long-term place of residence to places being 'meaningful as expressions of a person's individual trajectory and identity' (10, p. 39).

Our results challenge prevailing approaches to framing community in environmental policy and management, and suggest that categorization of stakeholders needs to go beyond location and use to also consider the nature of individuals' attachment to place. Our findings – specifically that communities framed by location or use were highly heterogeneous in terms of individuals' bonds to the GBR, and that non-local stakeholders can form emotional and instrumental bonds with the GBR – support the localist critique of conventional conceptualizations of community, as well as the concern that these framings of community are ill-suited as proxies for groups with shared environment-related interests. Nevertheless, we are not advocating that use and location framings of community be abandoned. Indeed, these types of community are integral to on-ground management of proximate drivers (e.g. fishing, tourism, pollution) and will continue to be important entry points for public participation also because they are easily identifiable and often form political units. Rather, we suggest – together with current community scholars (5) – that the multiple forms of community that are constituted across the varying ways in which people and nature relate are relevant to environmental policy. More specifically, we posit that managers and policymakers may simultaneously draw on use, location and attachment framings of community, and that the role of each framing will depend on the purpose and nature of the public participation initiative.

The concept of communities of place attachment outlined here contributes to advancing theory on community in environmental policy, and may aid policymakers and managers in public participation and fostering environmental stewardship in three ways. First, directly ascertaining and accounting for communities of attachment may help managers understand and respond to the intangible, but supremely important emotional, cognitive and instrumental bonds people have with place. A more nuanced understanding of the importance of place may aid in: predicting how people will react and be impacted by policy change (20); understanding why people participate or not in management (22); building trust with stakeholders and communicating effectively (38). This would contribute to overcoming the critique that communities of use or location are ill-suited to serve as surrogates for groups with shared environment-related interests. In terms of communicating with relevant communities in the GBR region, for example, accounting for people's bonds with the GBR could take the form of tailoring communication material to each of the four attachment communities. Tailoring communication material to the interests and values of specific audience segments increases the likelihood that the material will be read, understood, recalled, and thus, be effective in influencing attitudes and behavior (39). Although the benefits of targeting communication via audience segmentation are well recognized (40) and have long been used in business advertising and social marketing (particularly in the health sector), such approaches have yet to be widely applied in environmental management (41).

A second approach to employing communities of place attachment in public participation involves policymakers and managers purposefully fostering attachment communities, rather than just accounting for them. As suggested by Wyveen et al. (38), to generate broad civic support for management, managers can take an active role in contributing to conversations that help shape the thoughts and feelings that give rise to place attachment. Given that the communities of attachment we identified transcend use and location communities, individuals' bonds with the GBR could provide a 'common ground' with which to unite individuals that have previously been treated separately by GBR managers. This could be particularly important in regard to communities that have a history of conflict, for example commercial fishers and tourism operators (e.g. 42). Indeed, a number of studies advocate the utility of highlighting and fostering shared place attachment (9) – and other subjective connections with nature, such as environmental values (e.g. 12) – for conflict resolution.

Lastly, fostering transnational communities of attachment could provide a means to engage and facilitate stewardship among non-local individuals who are strongly attached to the GBR (i.e. those belonging to the Reef Connected and Armchair Enthusiast communities). These communities of attachment would reflect 'imagined communities' (43) and more particularly, 'imagined cosmopolitan communities of global risk', Beck's (44) development of Anderson's seminal proposition that extends the concept from nations to transnational social constellations that form through shared awareness of global risk and responsibility. These communities are

imagined in the sense that members 'will never know most of their fellow-members, meet them, or even hear of them, yet in the minds of each, lives in the image of their communion' (43, p. 6). Sociocultural and political symbols play an important role in the construction of imagined communities and consequently, these forms of community are reliant on 'worldwide communications and mobility processes' (44, p. 1353).

Transnational imagined communities in relation to the GBR are already emerging online, in the form of Twitter communities (45) and various online advocacy groups, such as 'Fight for the Reef' ([fightforthereef.org](http://fightforthereef.org)), which presently has over 250,000 members. In particular, the soon-to-be launched 'Citizens of the GBR' initiative ([citizensgbr.org](http://citizensgbr.org)) – self-described as a 'global social purpose movement founded to empower individuals from every place...to collectively...protect and enjoy our greatest natural inheritance, the GBR' – embodies the concept of transnational imagined communities of attachment to the GBR. Thus, GBR managers have an opportunity to foster transnational communities of attachment via social media and other forms of internet communication by employing imagery and discourse targeted to appeal to people's shared bonds to the GBR, particularly emotional bonds related to identity. Such an approach is likely to be particularly successful given the major damage sustained to the GBR by recent coral bleaching (16); threats to identity are often an important catalyst for individuals to collectively organize and engage in actions to protect their shared identity (46).

There are multiple existing pathways through which non-local stakeholders belonging to transnational imagined communities of GBR attachment could be engaged in stewardship in relation to the GBR. In an era of globalization, proximate environmental drivers (e.g. fishing) are increasingly influenced by process that operate beyond the local (e.g. international market demand), thus providing opportunities for non-local stakeholders to contribute to stewardship of distant places. These opportunities include: (1) sustainable individual consumption (e.g. reducing individual carbon emissions, buying sustainably-sourced fish); (2) lobbying national governments (e.g. in regards to climate change policy), international organizations (e.g. World Heritage Committee) or transnational corporations (e.g. in regards to corporate social responsibility; 6); and (3) supporting relevant non-government organizations that operate at local to global scales to, for example, monitor implementation and compliance with environmental commitments (14). However, engaging non-local stakeholders in public participation in relation to the GBR will require a transformation in governance. Indeed it is increasingly recognized that addressing contemporary sustainability challenges requires establishing multilevel global institutions (e.g. 47) that enable transnational public participation (e.g. 48).

Redefining types of community relevant to a resource and enabling transnational public participation has important consequences for power dynamics in environmental decision-making. Indeed, given the 'all-affected principle' of deliberative democracy – that 'all those people who are affected by a particular law, policy or decision ought to have a voice in making it' (49, p. 16) – naming types of affected communities, in itself, represents an exercise in framing power (50). The very act of designating the GBR as a World Heritage Area is an example of framing power that makes claims to the importance of non-local people's values in managing the GBR. A particularly important consideration in extending the notion of community is the normative question of the appropriate balance between local and non-local stakeholders' values, attachments and power in decision-making. While this is beyond the scope of our paper, it represents an important area of future research.

**Conclusion** – This research advances and integrates concepts of both place attachment and community public participation in environmental policy, with important implications for environmental management policy and practice. We examined for the first time how types of attachment to a particular place vary among people residing locally, nationally and internationally, thus informing recurrent debates regarding how place attachment is affected by mobility and whether it implies parochialism. Our key findings – that ongoing direct experiential processes do not always lead to the formation of emotional bonds and that such bonds can form without ongoing firsthand experience – challenge traditional perspectives on place attachment that emphasize the central role of direct experience with a place. Our results suggest that as human-environment interactions change with increasing mobility and globalization, new *types* of people-place relations that span geographic and social boundaries are emerging.

While conventional framings of community according to use and location provide important entry points for public participation, we suggest that employing a communities of attachment approach has the potential to strengthen public participation and promotion of stewardship. A place attachment framing of community provides a means through which to understand the critical and largely neglected non-material bonds people form with places and offers a common ground to unite members of traditionally separate communities of use and location – including, importantly, non-local stakeholders. Thus, a communities of attachment approach could contribute to overcoming the localist critique of prevailing conceptualizations of community in environmental policy, enabling policymakers and managers to better address many key drivers of current environmental change



that require management, civic and political action at scales beyond the local. In conclusion, employing a place attachment framing to community in environmental policy and management offers opportunities to leverage local to global stewardship, critical to advancing global sustainability in our increasingly connected world.

## **Methods**

**The Great Barrier Reef (GBR)** – The GBR is the world’s largest coral reef system, spanning 2,300 km along the east coast of Queensland, Australia. However, this World Heritage Area is under threat from a myriad of drivers, including climate change, poor water quality and fishing (16). In 2015, the GBR’s management body (the GBR Marine Park Authority; GBRMPA) released a 35-year management plan, which highlighted the importance of understanding stakeholders’ values for the GBR, and a strong reliance on stakeholder stewardship and management support. GBRMPA tends to engage civil society via communities of location (e.g. Local Marine Advisory Committees (LMACs), which are associated with 12 coastal regions) and communities of use (key groups include commercial fishers, tourism operators, and coastal residents). Although the value of the GBR to national and international residents is certainly recognized by GBRMPA, these non-local stakeholders tend not to be the target of public participation activities.

**Sampling** – We collected data on place attachment in regard to the GBR through semi-structured surveys with 5,403 individuals. Our respondents could be designated as belonging to one of five key communities of use that GBRMPA identifies and engages with, including: coastal residents of the GBR region (n=2,693); indigenous coastal residents (n=99); tourists (domestic and international who reside outside the GBR region) to the GBR marine park (n=2,305); GBR tourism operators (n=113); and fishers with a commercial license to operate in the GBR (n=193). Further detail is provided in Supporting Information.

**Place attachment indicators** – We operationalized place attachment to the GBR with three indicators relating to the two key dimensions of place attachment that are commonly identified, namely place identity and place dependence (e.g. 18). Our three indicators of place attachment were represented by 10-point Likert scale statements. Place identity was represented by the following statement: ‘The GBR is part of my identity’. Place dependence was operationalized using two statements in order to capture both indirect and direct types of dependence; these were: ‘I value the GBR because it supports a desirable and active way of life’ (indirect) and ‘There are many other places that are better than the GBR for the recreational activities I enjoy’ (direct). Direct place dependence was tailored to capture the specific activity through which each community of use directly engaged with the GBR. Thus, ‘recreational activities’ was replaced by ‘commercial fishing’ and ‘tourism operations’ for commercial fishers and tourism operators, respectively. The indicator was reverse-coded. Further detail is provided in Supporting Information.

**Data analyses** – To identify emergent communities based on multiple dimensions of place attachment we conducted an agglomerative cluster analysis based on our respondents’ reported levels of place identity, direct and indirect place dependence (see Supporting Information). We used chi-square analyses to compare communities of use, location and place attachment. All analyses were conducted in R (3.1.3)

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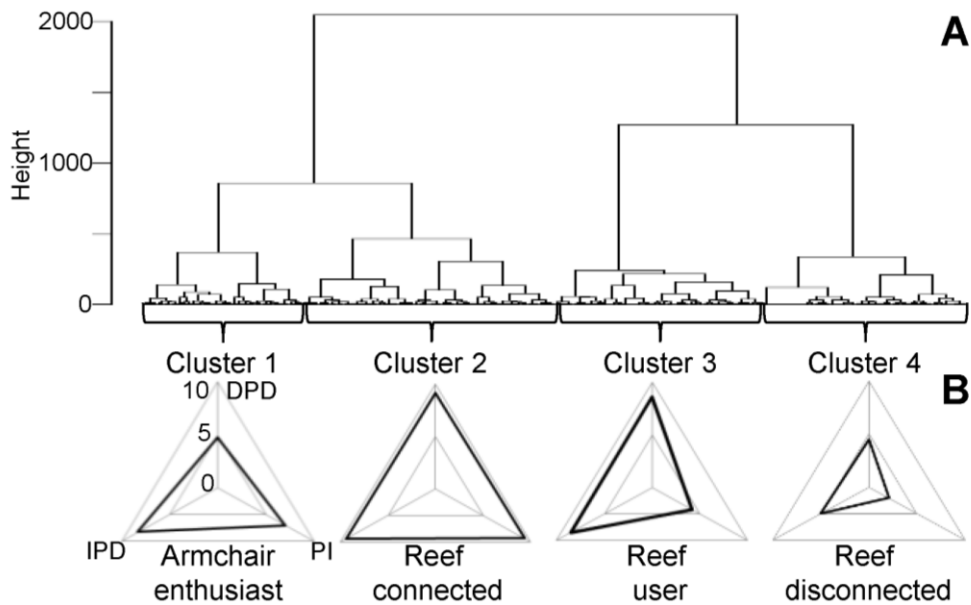


Fig. 1. Results from cluster analysis showing classification of respondents (n=5,403) based on three dimensions of place attachment. Dendrogram (A) reveals respondents form four distinct clusters, representing four emergent communities based on place attachment. Height refers to dissimilarity based on Euclidean distance. Spider diagrams (B) show mean level of indirect place dependence (IPD), direct place dependence (PD) and place identity (PI) per cluster. Cluster names are based on type of place attachment as indicated by the level of each attachment dimension. High values on spider diagram axes represent high levels of the relevant place attachment indicator.

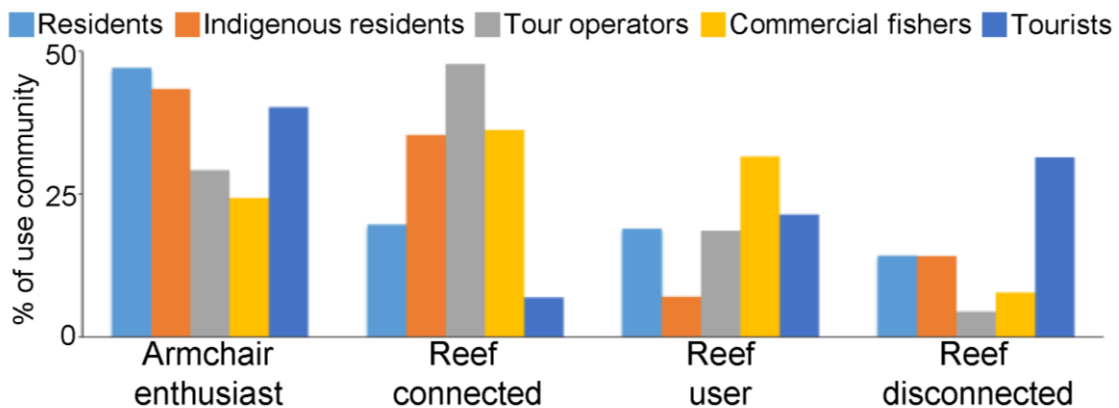


Fig. 2. Distribution of communities of use between emergent communities of place attachment identified in the cluster analysis.

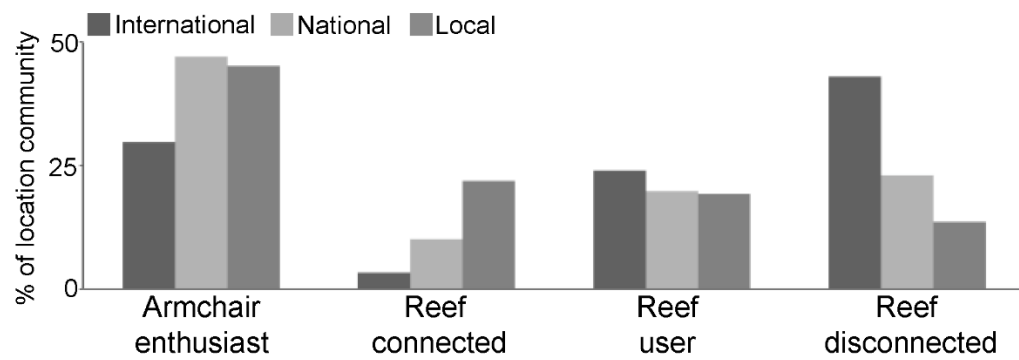


Fig. 3. Distribution of adapted location communities between emergent communities of place attachment identified in the cluster analysis. Given that the distribution of stakeholders between clusters does not significantly differ among the 12 local communities of location (Table S2), data were pooled to ease interpretation.